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E. K. E. Gunderson

C. F. Garland

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NAVAL HEALTH RESEARCH CENTER
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SAN DIEGO, CA 92186-5122

BUREAU OF MEDICINE AND SURGERY (MED-02)
2300 E ST. NW
WASHINGTON, DC 20372-5300



**HEALTH SURVEILLANCE IN THE U.S. NAVY:
ASTHMA**

E. K. Eric Gunderson, Ph.D.¹

Cedric F. Garland, Dr. P.H., F.A.C.E.^{1,2}

¹Longitudinal Studies and Health Sciences Program

Naval Health Research Center

and

²Department of Family and Preventive Medicine

University of California, San Diego

Naval Health Research Center

P. O, Box 85122

San Diego, CA 92186-5122

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Abstract

Context: Incidence rates of asthma in young adults appear to have been rising in the general population. Time trends and demographic risk factors are reported here for asthma in a well defined population at risk of U.S. Navy young to middle-aged adults.

Objective: To measure time trends and demographic risk factors for asthma.

Design: Incidence rate survey of first hospitalizations for asthma in a defined military population at risk.

Setting: U.S. Navy and its worldwide medical care system. Includes 4,809,422 person-years at risk among shore-based Navy enlisted service members during 1980-1996.

Patients: Navy enlisted personnel first hospitalized for asthma (ICD9 Code 493) during 1980- 1996.

Main outcome measure: Incidence rate of first hospitalization for asthma.

Results: There were 2,320 first hospitalizations for asthma during 1980-1996, including 1,648 men and 672 women. The incidence rate of first hospitalizations for asthma was 35.4 per 100,000 person-years (95% confidence interval 33.2-37.6) in men and 109.7 per 100,000 person-years (95% CI, 97.3-138.8) in women during 1980-1989. It was 39.2 per 100,000 (95% CI, 36.7-41.8) in whites and 58.1 per 100,000 (95% CI 50.9-66.1) in blacks. Annual incidence rates in men rose from 42.2 per 100,000 (95% CI, 34.6-51.6) in 1980 to 49.7 per 100,000 (95% CI, 40.7-60.6) in 1996, while rates in women rose from 151.3 per 100,000 (95% CI, 99.7-220.9) in 1980 to 265.9 per 100,000 (95% CI, 210.1-335.0) in 1996.

Conclusions: There was a steep rise in incidence rates of hospitalized asthma in women during 1980-1996, and a moderate rise in rates in men. Incidence rates in women were approximately five times those in men in recent years.

Introduction

About 10.2 million adults in the United States report asthma symptoms (wheezing, cough, shortness of breath, and chest tightness) and the estimated prevalence of asthma is 7.2% (1). The prevalence of self-reported asthma symptoms is similar in the military, ranging from 4.1 to 7.2%, making it one of the most common chronic diseases in the military (2). In pediatric populations, hospitalization has increased markedly over the last 30 years (3), and morbidity and mortality from asthma continue to increase despite advances in treatment (4). Exercise induced asthma can often occur as a manifestation of asthma that may not readily be detected during screening for military service (5). Of 59,058 Israeli army recruits, 1% developed asthma during 30 months, with exercise-associated symptoms as an early indicator (6). Although asthma in young adults is responsible for considerable morbidity, few systematic studies of the incidence of first hospitalizations for asthma in young adult populations have been published (7,8). This study describes the occurrence of first hospitalizations for asthma in the U. S. Navy during 1980-1996.

Methods

The focus of this study was rates of first hospitalization for asthma in Navy enlisted personnel during 1980-1996. Data were extracted from the Career History Archival Medical and Personnel System (CHAMPS), a database that provides career and medical information on all active-duty military members (9). Hospitalization data were compiled from Standard Inpatient Data Record (SIDR) databases provided by the Department of Defense Corporate Executive Information System (now the Executive Information/Decision System) in Washington DC and the Naval Medical Information Management Center in Bethesda, Maryland. Career history data were compiled from personnel record extracts and monthly extract tapes from the Defense Manpower Data Center, Monterey CA, reflecting demographic information and important changes in military status. Data elements from all files were combined and organized in chronological order by date and type of event. The database tracked members from entry into service until discharge from service. The cases included 1,242 Navy enlisted personnel stationed ashore who were during 1980-1989 and 1,083 cases admitted during 1990-1996. Personnel admitted to shipboard medical facilities were not included in this study because such admissions were not reported in the 1990s. Asthma cases were identified using the three-digit International Classification of Diseases, 9th Revision (ICD-9) diagnostic category for asthma (Code 493). Diagnoses were made by physicians at the time of discharge from naval hospitals. All information used in the study was from official records.

First hospitalization rates were computed using the Epidemiological Interaction System (EPISYS), a computer program that permits access to and analyses of epidemiological data using the CHAMPS database. EPISYS currently contains demographic, occupational, duty assignment, and hospitalization data

for all Navy enlisted personnel on active duty from January 1980 through December 1999. Denominators used by EPISYS are person-years calculated by a method described elsewhere (10). The study was conducted in two parts. The first phase involved the 1,242 hospital admissions of shore-based sailors during 1980-1989. This was a period of stability in population trends and operational conditions and can be viewed as a base-line period. The second phase, which included 1,083 first hospitalizations, was the 1990-1996 period, which included the Gulf War and its aftermath. There were large deployments of forces overseas followed by reduction of forces. The analysis of temporal changes in admission rates involved all admissions of shore-based sailors during 17 years.

Results

Incidence (first hospitalization) rates by age, sex, and race during 1980-1989 are shown in Table 1. The overall incidence rate of first hospitalization was 41.6 per 100,000 person-years. The rate for women was more than three times the rate for men (109.7 vs. 35.4). The rate for black personnel was higher overall than the rates for other racial groups. Black men had a higher incidence rate than white men, but rates in black women did not differ from rates in white women. The youngest age groups (age 17-19 years) in white and black men had significantly higher rates than older age groups. Higher rates were also present in the youngest age group in black women. The differences by gender in incidence rates of first hospitalization for asthma in Navy enlisted service members are shown in Table 2 and Figure 1.

During 1980-1989 rates for men and women remained stable but increased slightly during 1993-1996 (Table 2). For men the asthma rate increased from 35.4 (33.2-37.6) during 1980-1989 to 48.1 (43.9- 53.0) during 1993-1996; for women the rate more than doubled from 109.7 (97.3-138.80) during 1980-1989 to 241.9 (214.1-273.3) during 1993-1996.

Pay grade was related to first hospitalization rates for asthma. Non-rated personnel (those in pay grades E-1 through E-3) consistently had much higher asthma first hospitalization rates than petty officers (E-4 through E-9). Groups examined included Seaman Recruit (E-1), Seaman Apprentice (E-2), and Seaman (E-3); Fireman Recruit, etc.; Airman Recruit, etc.; Hospitalman Recruit, etc., and Dentalman Recruit, etc. In all cases, first hospitalization rates were higher for the non rated categories. For example, for the Seaman, Airman, and Fireman non-rated categories combined, the rate was 513.1 per 100,000 compared to 42.2 for all shore based personnel.

Discussion

Asthma recurs episodically, varies in intensity and duration, and symptoms may be completely reversible. Adult onset of asthma is relatively common and

can vary in severity from mild symptoms treated in an outpatient setting to severe attacks that may be fatal. This study is based on cases that were severe enough to require hospitalization, and does not include milder presentations. Data on asthma diagnosed solely on an outpatient basis were not available for this study period.

Department of Defense accession policy (DOD 6130.3) disqualifies individuals for appointment, enlistment, and induction in the armed forces who have a "history of asthma, reliably diagnosed at any age." The Department of the Navy Manual of the Medical Department disqualifies candidates with asthma symptoms or use of asthma medications after age 12. Despite these generally restrictive policies, asthma was the most common reason for separation of Navy recruits for a medical condition existing prior to enlistment (11).

National trends in hospitalizations attributable to asthma have been estimated from the National Hospital Discharge Survey conducted annually with ICD-9-CM Code 493 listed as the primary diagnosis. The estimated number of asthma related hospitalizations increased nationally from 386,000 to 466,000 between 1979-1980 and 1993-1994. During this period hospitalization rates were consistently higher among black persons than whites. Despite notable advances in the diagnosis and treatment of asthma in recent years, prevalence and mortality have increased. In the Navy population there was clearly an increase in asthma hospitalizations, particularly for women. Navy data confirm the racial differences seen in national trends. Because of the limited age range in military populations, it was not meaningful to compare Navy results with national hospitalization incidence trends for age. In the Navy, highest rates are found in the youngest and oldest age groups. The relatively high rate among the youngest age group (age 17-19) suggests a possible need for greater screening for history of asthma at time of enlistment.

Conclusions

The rate of asthma in women more than doubled in the most recent time period studied (1993-1996) and was approximately five times as high as the rate for men. There was considerable variation in rates related to race and age, and there were large differences in hospitalized incidence rates among occupational levels (pay grades).

The relatively high asthma hospitalization rate of service members during their first two years of service suggests the need for review of the policy of granting waivers to individuals who present histories of asthma or manifest symptoms at the time of enlistment. A longitudinal study of personnel receiving such waivers would be desirable to evaluate the efficacy of this policy. The health surveillance approach used in the present study cannot explain factors

influencing variations in asthma incidence rates but can identify groups at high risk and may suggest areas of inquiry that can lead to better management and control of this disease. Preliminary data on the period from 1996 to 2000 have not yet been fully released, but suggest that there has been a downward trend in prevalence rates of hospitalization for asthma in members of the military service members (13), suggesting that some of the issues regarding early screening for history of asthma may have been partly addressed.

References

1. *Morbidity and Mortality Weekly Report*, (2001) Aug 17; 50(32):682-6.
2. The Iowa Persian Gulf Study Group (1997). Self-reported illness and health status among Gulf War Veterans. A population-based study. *JAMA*, 277(3): 328-45.
3. Crater DD, Heise S, Perzanowski M, Herbert R, Morse CG, Husley TC, Platts-Mills T. (2001). Asthma hospitalization trends in Charleston, South Carolina, 1956 to 1997: twenty-fold increase among black children during a 30-year period. *Pediatrics*, 108(6):E97.
4. Castro M, Schectman KB, Halstead J, Bloomberg G. (2001). Risk factors for asthma morbidity and mortality in a large metropolitan city. *J Asthma*, 38(8): 625-35.
5. Carson J (1988). Bronchial asthma in servicemen--a personal view. *J R Army Med Corps*, 134(3):138-45.
6. Katz I, Moshe S, Sosna J, Baum GL, Fink G, Shemer J. (1999). The occurrence, recrudescence, and worsening of asthma in a population of young adults: impact of varying types of occupation. *Chest*, 116(3):614-8
7. Sims JR, Tibbles PM, Jackman RP. (1999). A descriptive analysis of asthma in the U.S. Navy Submarine Force. *Aviat Space Environ Med*, 70(12): 1214-8.
8. Young SY, Gunzenhauser JD, Malone KE, McTiernan A.(2001). Body mass index and asthma in the military population of the northwestern United States. *Arch Intern Med*, 161(13):1605-11.
9. Gunderson EKE, Miller MR, Garland CF. (2001). The Career History Archival Medical and Personnel System (CHAMPS): A Database for Epidemiological studies of Cancer and Other Major Diseases. San Diego, (CA):Naval Health Research Center.
10. Jaeger JA, White MR, Show IT. (1997). EPISYS (Epidemiologic Interaction System). San Diego, (CA): Naval Health Research Center.Tech Doc No.97-1A.

11. Garland FC. Personal Communication, San Diego (CA): Naval Health Research Center August 1999
12. Mannino DM, Homa DM, Pertowski CA, et al. (1998). Surveillance for Asthma—United States, 1960-1995. *Morbidity and Mortality Weekly Report*, CDC Surveillance Summaries, 47(1):1-27.
13. Hansen CJ, Smith TC, Neville J, Ryan MAK, Russell K, Adjusted annual prevalence of hospitalizations for asthma examined for active-duty Department of Defense personnel (abstract). San Diego, CA: San Diego Epidemiology Exchange, University of California, San Diego May 3, 2002.

Table 1. Incidence Rates for Asthma by Age, Sex, and Race for US Navy Active-Duty Enlisted Shore Personnel, 1980-1989

Men								
	White				Black			
Age (yr)	No. Of Cases	Person-Years	Rate	95% Confidence Limits	No. of Cases	Person-Years	Rate	95% Confidence Limits
17-19	152	280,819	54.1	51.0-56.9	43	48,343	88.9	78.6-96.9
20-21	147	437,460	33.6	31.6-35.3	40	75,478	53.0	45.6-57.9
22-24	124	488,971	25.4	23.7-26.8	44	85,454	51.5	45.6-56.0
25-29	131	442,440	29.6	27.7-31.2	28	83,485	33.5	28.6-37.1
30-34	76	257,051	29.6	27.0-31.6	17	39,813	42.7	34.2-48.2
35-39	52	185,994	28.0	25.0-30.2	7	18,178	38.5	25.5-45.0
>39	40	93,178	42.9	30.6-58.3	4	8206	48.7	13.2-124.6
Total	722	2,185,914	33.0	32.2-33.8	183	358,958	51.0	48.3-53.4
Women								
	White				Black			
17-19	29	22,735	127.6	109.0-140.9	13	6192	209.9	161.2-239.6
20-21	42	39,178	107.2	94.5-116.8	12	10,576	113.5	85.8-129.9
22-24	53	50,479	105.0	94.1-113.5	14	14,031	99.8	77.6-113.5
25-29	36	47,679	75.5	65.8-82.7	13	13,440	96.7	74.3-110.4
30-34	31	20,858	148.6	127.8-163.8	2	5061	39.5	9.1-46.3
35-39	15	7123	210.6	165.7-238.9	1	1418	70.5	0.0-74.3
>39	4	2016	198.4	54.0-507.9	0	226	0.0	0.0-0.0
Total	210	190,067	110.5	105.0-115.3	55	50,941	108.0	97.0-116.6

Sex								
Men	967	2,732,701	35.4	33.2-37.6				
Women	275	250,761	109.7	97.3-138.8				
Race								
White	932	2,375,906	39.2	36.7-41.8				
Black	238	409,882	58.1	50.9-66.1				
Other and unspec.	72	197,664	36.4	28.6-46.2				
Total	1,242	2,983,462	41.6	40.8-42.2				

Table 2. Incidence (First Hospitalization) Rates Per 100,000 Person-Years for Asthma in U.S.

Navy Active-Duty Enlisted Shore Personnel by Sex and Year, 1980-1996

Men					Women			
Year	No. of Cases	Person-Years	Rate	95% Conf. Int.	No. of Cases	Person-Years	Rate	95% Conf. Int.
1980	110	260,840	42.2	34.6-51.6	27	17,852	151.3	99.7-220.9
1981	102	261,847	38.9	31.9-47.8	20	20,311	98.5	60.2-151.7
1982	116	259,408	44.7	37.1-54.1	23	21,907	105.0	66.9-157.5
1983	85	265,445	32.0	25.3-39.8	32	23,641	135.4	92.1-192.3
1984	94	272,777	34.5	27.9-42.4	20	24,921	80.3	49.1-123.7
1985	96	276,748	34.7	28.1-42.7	31	26,689	116.1	78.9-166.0
1986	95	281,140	33.8	27.4-41.6	27	28,114	96.0	63.3-140.2
1987	99	283,229	34.9	28.6-42.6	21	27,852	75.4	46.7-115.4
1988	79	283,862	27.8	22.2-34.7	30	28,751	104.3	79.4-149.1
1989	91	287,426	31.7	25.7-39.3	44	30,701	143.3	104.6-192.0
1990	78	264,181	29.5	23.3-36.9	41	29,275	140.0	99.4-190.4
1991	103	262,059	39.3	32.2-47.9	44	29,098	151.2	108.9-204.1
1992	89	250,190	35.6	28.8-44.1	44	25,417	173.1	124.6-232.0
1993	106	238,271	44.5	36.5-54.3	63	28,082	224.3	172.7-289.3
1994	108	219,134	49.3	40.4-60.1	70	27,548	254.1	199.5-322.7
1995	100	201,966	49.5	40.6-60.4	61	27,812	219.3	168.9-285.1
1996	97	195,298	49.7	40.7-60.6	74	27,830	265.9	210.1-335.0
TOTAL	1,648	4,363,621	37.7		672	445,801	150.7	

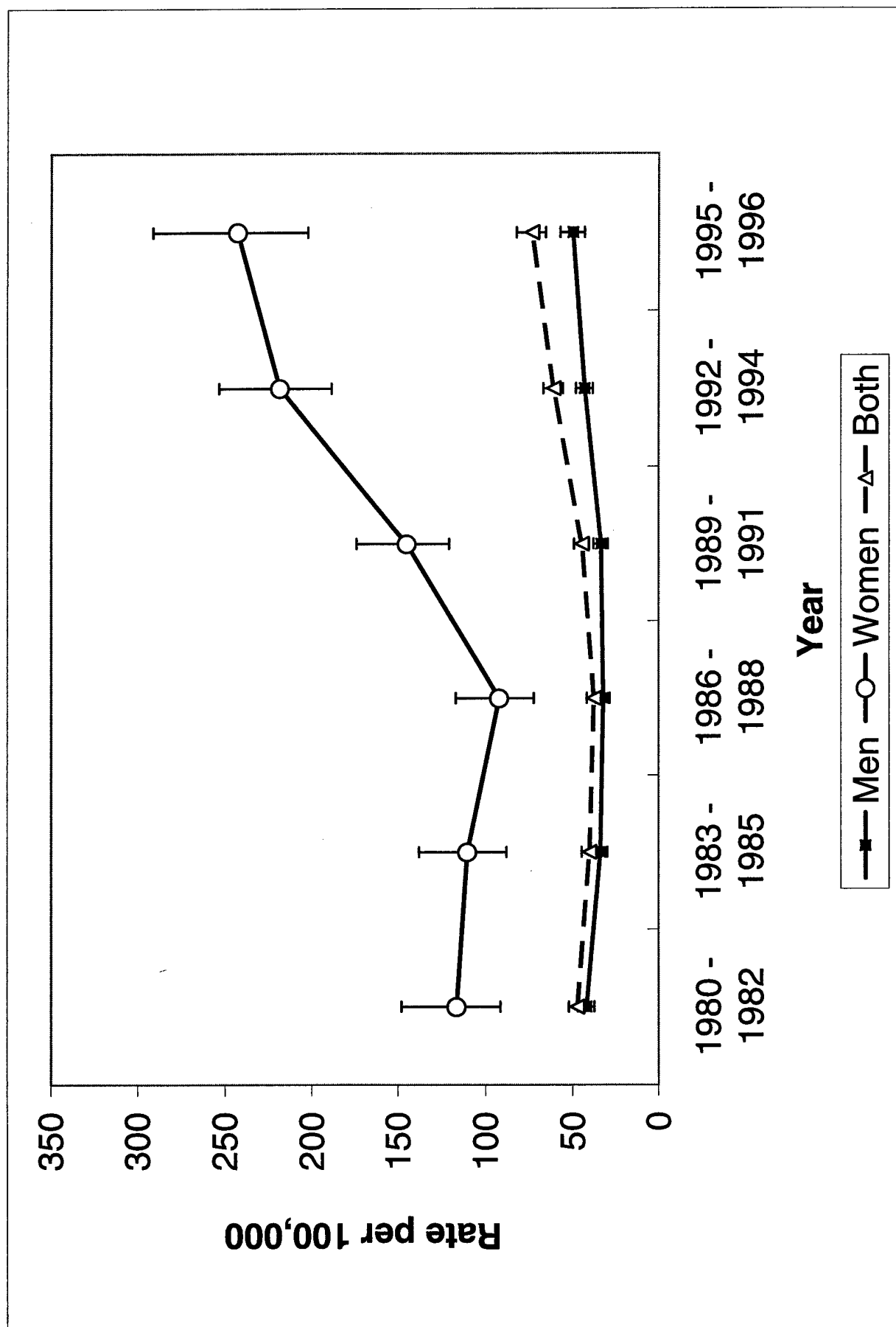


Figure 1. Trend in incidence rates of first hospitalization for asthma per 100,000 oersib-years, Navy enlisted service members of both sexes, 1980-1996

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13. SUPPLEMENTARY NOTES

14. ABSTRACT (maximum 200 words)

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Conclusions: There was a steep rise in incidence rates of hospitalized asthma in women during 1980-1996, and a moderate rise in rates in men. Incidence rates in women were approximately five times those in men in recent years.

15. SUBJECT TERMS

Asthma, temporal trends, risk factors, rae, sex, epidemiology, military populations, incidence rates

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